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The social implications of humancentric chip implants: a scenario - 'Thy chipdom come, thy will be done'

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Abstract

Radio frequency identification (RFID) chip implants for humans are no longer the tales of science fiction. Already preliminary findings have shown that the number of people willing to get chipped has increased since the technology's commercial arrival in 2002, despite the fact that adoption rates have been very low. This investigation presents three case studies of the main users/ innovators of humancentric chip implants. The first case is of a British researcher in an academic institution who has conducted several implant experiments; the second case, is of a hobbyist and entrepreneur who has focused on the use of RFID implants for personal space applications; and the third is a family who opted to receive RFID implants from a commercial organization. The results of the cases are collated and presented within a real-life context scenario. The intent of the scenario is to showcase the potential societal implications if widespread adoption of the technology was to ensue. Besides the privacy and security themes that are commonly discussed in chip implant studies, other issues covered by this scenario include that of equity and ethics. For instance, will chip implant technology cause a division in upper and lower social classes? And the ethical question of who decides who gets chipped? It was found that an implantee's motivation to getting a chip implant is closely linked to the experiences they each hope to have after implantation. The scenario leaves the reader pondering whether or not widespread adoption of chip implants will be detrimental to society or just another techno-cultural change.

Keywords

chip implants, RFID applications, humans, scenario, social implications, ethics

Disciplines

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The Social Implications of Humancentric Chip Implants: A Scenario - ‘Thy Chipdom Come, Thy Will be Done’

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Abstract

Radio frequency identification (RFID) chip implants for humans are no longer the tales of science fiction. Already preliminary findings have shown that the number of people willing to get chipped has increased since the technology's commercial arrival in 2002, despite the fact that adoption rates have been very low. This investigation presents three case studies of the main users/ innovators of humancentric chip implants. The first case is of a British researcher in an academic institution who has conducted several implant experiments; the second case, is of a hobbyist and entrepreneur who has focused on the use of RFID implants for personal space applications; and the third is a family who opted to receive RFID implants from a commercial organization. The results of the cases are collated and presented within a real-life context scenario. The intent of the scenario is to showcase the potential societal implications if widespread adoption of the technology was to ensue. Besides the privacy and security themes that are commonly discussed in chip implant studies, other issues covered by this scenario include that of equity and ethics. For instance, will chip implant technology cause a division in upper and lower social classes? And the ethical question of who decides who gets chipped? It was found that an implantee's motivation to getting a chip implant is closely linked to the experiences they each hope to have after implantation. The scenario leaves the reader pondering whether or not widespread adoption of chip implants will be detrimental to society or just another techno-cultural change.

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1 Introduction

Humancentric chip implants, technology under the skin, microscopic digital angels ... In the past, this technology would have been associated with futuristic advances in technology as depicted in *Star Trek*; but not anymore. Radio-frequency identification (RFID) chips are currently being injected into human bodies worldwide for personal recreational use, research, employment requirements and medical applications. While there has not yet been a widespread adoption of human chip implants, the technology is still in its early adoption phase. However, there is evidence suggesting that chip implants will be the next *big* technology and will continue to become increasingly popular as the applications for the chips expand. Kenneth R. Foster [1], former president of *IEEE Society on Social Implications of Technology*, has evaluated the possibility of businesses implementing mandatory chip implants for employees: "Sound farfetched? Today, yes. A decade from now, maybe not." Previous studies have established that there are many social implications associated with the use of chip implants in humans. Regardless, there are preliminary findings indicating that society is becoming increasingly willing to implant RFID chips into their bodies [2]. A possible explanation behind this occurrence is that the adopters of a new technology can often become distracted by the benefits that it can provide, rather than recognizing and evaluating the consequences that the technology can cause [3]. It is important for potential adopters to consider the societal implications of a technology, as "an informed and sufficiently aroused public can make a difference in the control of the implications a technology can impose" [4]. This study aims to explore the social implications of RFID chip implants in humans. The research aim will be achieved through conducting case studies on the main users and innovators of RFID chip implants. Subsequently these findings will be used to develop a scenario of a plausible future where RFID chip implants have been widely adopted and used in every day lives.

2 Literature Review

The most commonly used humancentric chip implant to date is the RFID chip. An RFID chip is a small glass capsule, approximately the size of a grain of rice (11mm long, 1mm diameter) that encloses a microchip and antenna coil [1]. The chip does not require an internal power source. A built-in antenna in the chip uses the magnetic field from an RFID reader to power the chip, allowing it to provide information [5]. In humans, the chip is normally injected into the forearm or hand using a hypodermic syringe or through an incision of the skin. Depending on the chip manufacturer, there may be a plastic cap on the chip that causes the chip to bond to human tissue and prevent the implant moving around the body [1].

Perakslis and Wolk have researched the development of human chip implant technology within a social context [2]. Their research describes the effect of September 11, 2001, upon "globalization and the converging interests of the information age" which they predict will lead to a growing acceptance of human chip implants as a method of providing security. The research provides statistical evidence for society's growing acceptance of RFID implants and the reasons behind them. Michael and Michael analyze the behavior of current automatic identification technology users and find that, "so long as individuals are gaining they generally will voluntarily part with a little more information" [3]. When participants adopt a technology it becomes a part of their lives and the benefits that the user receives are prioritized over the associated risks. They conclude that it is important for people to consider the social implications of technology, as they may be detrimental to not only themselves, but also society as a whole. Masters and Michael explore the current applications of humancentric RFID technology [6] and show that the current humancentric applications are focused on convenience, care, and control. Masters and Michael present a discussion on the social implications and ethics of the current applications of humancentric RFID technology. Privacy, security and ethics are found to be the main themes surrounding humancentric RFID. The societal implications of human chip implants in location based services (LBS) has been researched by Perusco and Michael. Perusco and Michael use scenarios to forecast what implications could arise if there is widespread adoption of implantable LBS technology [7].

2.1 The Next "Big" Technology

There is a growing amount of attention on the future of human chip implants and humancentric nanotechnology applications. Even before 2004, when the U.S. Food and Drug Administration (FDA) granted Applied Digital Solutions the permission to inject medical patients with a microchip, Black [8] expressed scepticism over the growing acceptance of microchip implants stating: "[a]n underskin microchip with medical data or GPS capability could soon be a commercial reality. Should we be afraid?" In December 2005, three employees of the U.S. Company *Citywatcher.com* were implanted with a microchip for access control applications. Foster and Jaeger [1], O'Connor [9], and VeriChip [10], all comment on this milestone, predicting that employees (and society at large) will be implanted for workplace applications before too long. McMurchie [11] is also clear on this point deliberating: "As we look at wearable computers, it's not a big jump to say, OK, you have a wearable, why not just embed the device?... And no one can rule out the possibility that employees might one day be asked to sport embedded chips for ultimate access control and security".

Marburger et al. [12] conducted a market analysis report on VeriChip with projected growth potential models estimating that "VeriChip will sell 1 million to 1.4 million chips in 15 years." Considering that in 2004, according to Lockton and Rosenberg [13], only approximately 7000 VeriChip RFID implants had been sold, the forecasted adoption is exponential in its estimate. It should also be noted that at the time of the Marburger [12] market analysis, only medical applications of the VeriChip had been approved by the FDA. Had this not been the case, the estimated growth potential models would have been even larger. The report by Marburger also states that the main target

market for chip implants is outside the United States, but that the United States will follow in due course as they are usually considered late adopters of high-technology devices [12]. Swartz [14] and Masters [6] have documented the presence of VeriChip in South American and European countries, showing the progression that VeriChip has made to making the human chip implant an international phenomenon, rather than restricted to North America.

2.2 Significance of Research

Graafstra [15] believes the “number of do-it-yourself RFID [implantees] has grown to include hundreds of people worldwide.” The publication of Graafstra’s [16] *RFID Toys* and his recent article in *IEEE Spectrum*, “Hands On: How Radio-Frequency Identification and I Got Personal” both contain explanations on how “RFIDs” [i.e. implantees] can implant themselves with chips. Attitudes have evolved in the last 5 years towards implanting of chips into the human body. Perakslis and Wolk [2] conducted surveys in 2002 that showed 78.3% of participants were unwilling to implant a microchip into their body mostly because it was “creepy.” However, 3 years later another survey shows that those unwilling to get a chip implant into their body was reduced to less than half (48%) and one third (33%) of respondents were willing [17].

Naisbitt and Philips [18] state: “once technology is embedded into society, such as into public policy, it is difficult to abandon.” While human chip implants are not presently regarded as being “embedded into society,” Foster and Jaeger [1] speculate that mandatory RFID implants as a job requirement is not a farfetched idea and could be a reality in the next decade. This paper is significant in that it grants the public the opportunity to ponder the social implications of microchip implants for humans, before widespread adoption. It is significant work, insofar as it explores the motivations, experiences and trajectories of current implantees and innovators. As one of the case studies, Mr Amal Graafstra commented: “My concern is not about the actual technology, I love the technology. I think that it is great, I hope it’s developed and used for good. My concerns are the people. A bomb is no worse than a flower, if no one presses the button.”

3 Methodology

This qualitative investigation utilized a multi-phase approach. In the first phase case studies were conducted. According to Yin [19] a case study is used to “contribute to our knowledge of individual, group, organizational, [and] social... phenomena.” The key questions addressed in the case study protocol included: (i) what motivated individual implantees to get their implants, (ii) how did the implantees feel after they had been implanted, and (iii) where the implantees believed the technology was ultimately headed. Three case studies are presented in this paper. The first case study is titled “Researcher”, and is focused on Professor Kevin Warwick, who implanted himself in the name of research [20]. The second case study is titled “Hobbyist”, which is focused on Mr Amal Graafstra, who acquired a humancentric implant for recreational purposes [15]. And the third case study is titled “Corporation”, focused on the Jacobs Family, recipients of the commercial VeriChip RFID implantable device.

3.1 Data Collection

Data for the case studies was collected from three main sources: (i) primary interviews with Professor Kevin Warwick and Mr Amal Graafstra conducted in 2007, (ii) primary sources (i.e. web sites of the individual case studies, including the VeriChip corporation), and (iii) secondary resources which were predominantly found in newspaper articles, online news reports, and journal articles between 2003 and 2007. The subjects of the case studies are well-known to the RFID community, widely considered pioneers and/or progressive innovators in their fields. This paper is the first to present an ensemble of evidence found in the great number of interviews conducted by the implantees with technology magazine reporters.

3.2 Data Analysis

Through qualitative document analysis on the relevant data collected, the case studies can be interpreted into narrative form. The analysis of the data will follow the case study protocol of discovering the implantee’s motivations for getting implanted, their experiences as implantees, and their thoughts of the technology and its trajectories. Hundreds of articles, secondary interviews and web pages that have discussed the social implications of chip implants were studied and major themes drawn out for inclusion in the scenario.

3.3 Scenario-Narrative

The second phase of analysis will be conducted using a scenario in the form of a short story. The narrative allows the reader to observe important themes in a given setting and background captured by the real-world case studies. Lindgren and Bandhold [21] define a scenario as “an internally consistent view of what the future might turn out to be.” In the context of the current research, this definition would suggest that the scenario will have a consistent view of the social implications that would arise in the future if human chip implants are widely adopted. The effectiveness of this method comes from the presentation- a future prediction based on current evidence provided by the subjects themselves. The advantage of involving both innovators and users as characters in the scenario allows a cross-case comparison presenting the different drivers and motivations for human chip implantation and the possible different social implications that may arise from each case. Diagram 1 shows the complete research design and two phased methodological approach of case study and scenario.

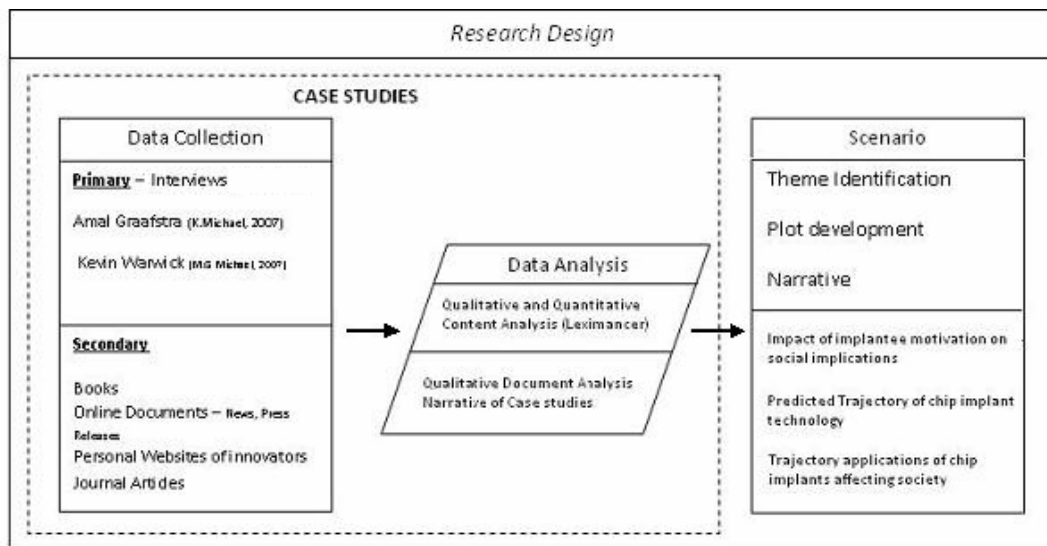


Diagram 1: Research Design

The use of case studies as the source for the scenario allows a degree of *literary truth* and provides an insight into the morals concerned with human chip implants. Artz [22] defines literary truth as “a correspondence between how characters behave in a story and how they would behave in similar circumstances in real life.” The use of imagination in scenarios is noted by Artz to “let us see the world, not as it is, but as it could be. And seeing the world as it could be allows us to make choices about how it should be.” Similarly, Grodzinsky [23] believes “moral imagination helps us envision the type of technology and society that we would like to live.” Therefore, by analyzing the case studies, combined with *moral imagination*, the current research is able to create a scenario that displays the current social consciousness. The scenario will assist the reader in developing an opinion on whether the use of chip implants is positive or negative for society.

4 Case Studies

4.1 Professor Kevin Warwick- Cybernetics Researcher

Monday, 24th August, 1998, risking life and limb in the name of research, Kevin Warwick became the first man to implant an RFID transponder under his skin [24, 25]. From this moment on, Warwick embarked on a research project that he hoped would lead to successful communications between human nervous systems and computers providing applications toward medical cures [26]. Till this day, Warwick still dedicates much of his research effort toward human evolution, “Cyborg: Half man, Half machine” [27, 28].

Professor Warwick, like many other pioneer microchip implantees, has had experience working in the telecommunications industry. When he completed high school at 16, he worked for British Telecom for six years before commencing an academic career acquiring a doctorate from Imperial College, London, and eventually being offered the Chair at Reading University [29]. It was at Reading University that he started Project Cyborg, where microchip implants on multiple occasions were implanted into Warwick’s body to further his research. Warwick strongly believes that “microchip implants [will] open the way to exciting new applications in the fields of medical science, bionics and human biometrics” [30]. When a technology is potentially physically harmful, it is unusual that the scientist researching and testing the technology will test it on themselves but despite the risks, Warwick felt that it was necessary. He told one reporter: “It’s one of those things, if you’re trying something like this for the first time, you need to experience it yourself... Experiencing it for myself and understanding what it feels like is tremendously exciting, and I actually get to benefit from it” [25]. His decision to implant himself was based on his consideration of others: “[H]aving one of the researchers or somebody else that didn’t need to carry out the experiment involved, and something went wrong - which it could easily do - I don’t know how I could live with myself. If it goes wrong and it’s me involved, then OK. I made the choice.” [25]

Warwick’s background also had a profound influence on the reason why he implanted microchips into his body: “I am historically from the communications field... For me, it was the possibility of opening up a new communication channel” [31]. Warwick sets out to achieve a similar breakthrough in the communications industry as Alexander Graham Bell and he believes that microchip implants are the tool that will enable this [31]. Similarly, Warwick’s background from working in the robotics field at Reading University [29] has influenced the motivation for implanting microchips into his arm. Warwick predicts that before the 22nd century, machines will have become more intelligent than human beings and believes that: “intelligent machines are going to outstrip humans in many ways and take over from us effectively” [32]. Warwick predicts that “[u]nless progress is halted now, which is extremely unlikely, then before long it will be intelligent machines running the show and not humans” [31]. He believes the only way to compete with the imminent robot domination, is by upgrading the human body with microchip implants, essentially

making humans more intelligent than the machines: “[a]s robots become free thinkers, the only way humans can compete is to use computers to enhance the human brain” [26].

Not only is Professor Warwick’s inspiration for chip implant research derived from self-accomplishment, but also from the achievement of helping patients diagnosed with certain illnesses. “The number of people benefiting from [my research] is now increasing,” says Warwick. There is a number of neural microchip implants developed by Warwick providing benefits for spinal injury [33], epilepsy and Parkinson’s disease sufferers, as well as a wide range of other terminal disease sufferers [25]. By experimenting with microchip implants in his own body, Warwick is able to develop applications for others. There is also the prospect of research and development funds (R&D) flowing from Warwick’s work. Warwick has received over £2 million in funding from different organizations in order to conduct his research [34]. These organizations that sponsor Warwick see it as an investment, as they themselves also benefit from the research outcomes. In one interview Warwick remarks about the potential for commercialization: ‘So if it’s a UK company that launches a thought communication device that takes off, they will make enormous sums of money, which will be good for the country, which is what we hope would happen’ [25].

4.2 Mr Amal Graafstra- *Hobbyist*

Mr Amal Graafstra of Bellingham, Washington, is the owner of several technology and mobile communications companies, and has a strong interest in photography as well as tinkering with the latest high-tech gadgetry. However, one thing sets him aside from typical 31-year-old males; he is the proud bearer of two RFID transponders implanted into his right and left hands. The transponders were implanted independently from any commercial or research organization and without any approval from the Food and Drug Administration of America, which regulates RFID implants for medical purposes [35]. “I wanted to be able to access my office door without getting my keys out of my pocket” [36]. Graafstra states interest as the primary reason for getting microchip implants embedded into his hands: “[b]asically, it really depends, for me, if it’s going to be any fun... and I don’t necessarily do the legwork that I should to make sure I make a lot of money from it.” Graafstra’s motivation for why he did it is similar to many other “do-it-yourselfers” and therefore represents the aforementioned Hobbyist case effectively.

A primary interview with Graafstra for this paper reveals that at an early age he became interested in technology and the mechanics of how computers worked. His tech-savvy nature combined with the observations he made from RFID tags implanted in pets were the stimuli that inspired Graafstra to introduce RFID implants into his own life. He told Shaw [37]: “I’m a project, gadget-builder kind of guy and I saw cats and dogs getting these tags and I spent a few years thinking about the different ways they could be used.” In 2005, Graafstra was working for a medical facility in Seattle where he had to carry around almost 100 different keys [15]: “That bulky key ring got me thinking. It struck me that modern keys are just crude identification devices, little changed in centuries... Now, if the tag is implanted in your body so much the better: it’s impossible not to have it when you need it.” Graafstra was hoping to move beyond traditional keys by eliminating the consequences of depending on a remote key: “If I’m in the alley naked, I want to still be able to get in [my house]” [38]. Using a chip implant, tasks in his everyday life are made more convenient while providing the novelty of not having to use external keys.

Although Mr Graafstra’s initial motivation to get a chip implant was for the convenience of eliminating keys, he has expressed that he would not have introduced RFID tags into his life if it did not provide a recreational experience for him: “Basically it really depends, for me, if it’s going to be any fun. There are a lot of things that could be put together but it takes a lot of work and it’s not all really fun in the end.” Graafstra’s recreational pursuit in this particular case demonstrates the recreational nature that exists within most hobbyist implantees.

4.3 VeriChip Corporation- *RFID Customers*

US\$200 for the chip, US\$200 for the implantation and US\$10 per month for subscription to the database; the cost to subscribe to Applied Digital Solution’s (ADS) VeriChip product. The VeriChip is a commercial RFID chip that is specifically designed to be implanted into humans. “This product saves lives,” claims ADS president, Scott Silverman [39]. The FDA approved the implantable RFID VeriChip in 2004 and since then more than 7000 VeriChips have been distributed [40] and approximately 2000 people have been recorded as being implanted with the chip [35]. ADS estimated in 2004 that the market for chipping exceeded US\$15 billion [41].

So far, VeriChip’s applications are concentrated on identification devices for emergency situations and access verification for security systems. Medical benefits have been cited as the most compelling reasons why people should receive a VeriChip: “[t]he entire VeriChip program is designed to save lives in an emergency and enhance the peace of mind of subscribers and their loved ones” reported an ADS media release [41]. The VeriChip can be used in situations where a person is unconscious and unable to provide important medical information to doctors. “We hope it will become an emergency room protocol,” says Leslie Jacobs, a VeriChip implantee. “If they don’t know your medical history, your drug allergies, they can do a lot of damage” [42]. Another application that the VeriChip provides is access to secured areas such as security doors or logging onto a computer. RFID scanners are installed into doors and computers and the participant scans the VeriChip when access is required. “Right now, I cannot find my car keys, but I have my chip,” says Sean Darks, CEO of Citywatcher.com, a company that has implemented the VeriChip system [10]. This application provides security as well as the convenience of constant access.

The prolonged FDA approval process provoked ADS to venture into other countries where there were no legislative conflicts [43]. The VeriChip has been sold in Brazil and Mexico since 2002 for identification applications of government officials and other citizens at risk of kidnapping, such as children and the wealthy. "The embedded system [is expected] to be big wherever there's a big threat of kidnapping," reports ADS [44]. ADS have also ventured into the European market, where night clubbers in Spain are implanted to gain access to the very important persons (VIP) areas. As well as acting as an identification method for access into clubs, it is also a new way of members paying for goods [45].

4.3.1 The Jacobs Family

The first "Chipsons," a trademarked name by ADS, were the Jacobs family; Jeffery, Leslie, and their son, Derek. On May 10th, 2002, all members of the Jacobs family were implanted with the VeriChip. Forty major media organizations, including a live audience on NBC's *Today*, watched the family become the first people to become "Verichipped" [41]. It all began with young Derek Jacob having an interest in the VeriChip after seeing it presented on NBC's *Today* show. "I thought it was great technology," he says. "I wanted to be a part of it" [43]. Derek, at the time of the implantation in 2002, was aged 14 and was completing eighth-grade. However, he was technically advanced in terms of qualifications, being Microsoft Certified as a qualified systems engineer and was already the owner of a computer-consulting company. Derek persuaded his mother into contacting ADS. "He kept bugging me to call the company until I finally broke down," said Leslie, Derek's mother [43]. Leslie Jacobs, aged 46 at the time of the implantation, met with Keith Bolton, Vice-President of ADS, to discuss the possibility of having her family implanted with the VeriChip [46]. Pending a lengthy FDA approval, the eventual outcome of this discussion saw a company-sponsored publicized chipping of the Jacobs family [41]. "We're doing this as a security for us, because we've worked so hard to save my husband's life," Leslie says, citing her husband's medical conditions as the primary driver for the meeting [41]. Jeffrey Jacobs (Derek's father) had previously been involved in a serious car accident where he was unable to identify himself and unable to explain his medical conditions to ambulance and hospital staff [43]. It is claimed, that by having the VeriChip, the identification dilemmas associated with emergency situations could have been avoided. This made Jeffrey an effective candidate to promote the VeriChip product as one of the marketing points of the VeriChip is that it can provide identification when a person is unable to communicate.

While the initial motivation for the implantation was Derek's interest in the technology, the overarching motivation was the medical benefits it could provide for his family. "It's great what it can do, it can save a lot of lives, including my Dad's because he has a lot of medical problems and I want him to be around for a while," said Derek Jacobs [47]. Jeffrey, Leslie and Derek all have medical ailments that would be of interest to doctors in the event of an emergency. Jeffrey is a Hodgkin's disease sufferer as well as having a long list of medications that he was taking at the time due to chronic eye disease, abdominal problems and a degenerative spinal condition [48]. Derek has allergies to common antibiotics [43] and Leslie has history of a mitral valve prolapse [46]. "The advantage of the chip is that the information is available at the time of need," Jeffrey explains. "It would speak for me, give me a voice when I don't have one" [43]. The family believes that the VeriChip will replace the different types of identification they use [49]. "Unlike your wallet, it can't be stolen," said Jeffrey. Tan [49] has noted that Derek dislikes wearing a silver medical alert bracelet because the children at school can tell that he suffers from allergies. The chip would provide a transparent sense of assurance for Derek and his family, knowing that in the event of an emergency his allergies can be identified and noted.

Considering that the Jacob's family implantation was sponsored by ADS, it can be argued that there was motivation for ADS to implant the VeriChips into the Jacobs family. It was around about this time that ADS also launched the "Get Chipped" campaign that saw a "Chipping Mobile" travel through the United States inviting people to get implanted. Chowka [41] and Streitfield [44] both observed how the Jacobs seemed like likely candidates for implantation of the VeriChip. Streitfield [44] described the process as a "national media event" with several reporters streaming the implantation to live television. It can be argued that the Jacobs family became tangible evidence in the promotion of the VeriChip, demonstrating the benefits the chip could provide to people with health issues.

5 Scenario: 'Thy Chipdom Come, Thy Will be Done'

"Honey, wake up, we have to get ready... It's time to get your chip implant."

Today, Thomas is taking the step that most middle and upper-class citizens will sooner or later experience in their life; he is getting *Lifechipped*. The Lifechip is a type of chip implant distributed by the multi-billion dollar company, ICA (Identify Control Access) Corporation, which enables identification and user access to a variety of Lifechip services.

"But I don't want to Mum, I have a tennis match this afternoon and the guys will be waiting for me," Thomas complains.

"It's for your own good Thomas, now get changed, eat your breakfast and let's go!" says his Mother.

Legislation has been enacted that allows parents and carers of minors and the disabled, to organize implantation on their behalf. Thomas' mother has been putting this off for years, but she has been saving up and now, for Thomas' thirteenth birthday, she is getting him chipped.

The toll-booth light turns green as Thomas' mother drives through; her chip implant communicating with the readers in the booth, advising that she has 38 trips remaining and is traveling at 70 kilometers per hour.

"But why do I have to get chipped, Mum? It's not like I drive?" Thomas argues.

"What if you got kidnapped, Thomas? What if you have a serious skateboard accident and become unconscious? How will the doctors know that you're allergic to penicillin given you refuse to wear your Medic-Alert necklace? Don't you remember that time when your face swelled up and you went into convulsions and we all feared the worst?"

Thomas shrugs it off in embarrassment and realizes that there is no way he is talking his mother out of it. Within himself he acknowledges that the allergic fits he had were kind of scary, but still he is not convinced a chip implant is worth it. The rest of the trip, the two sit in silence.

At the Lifechip office, Dr. Wojtysiak explains the process to Thomas and his Mother. "It's a quick five minute procedure. First I'll give your upper arm a wipe then I'll insert the chip using this small syringe device. Simple as that. It's just like having any other injection, only this one will momentarily hurt a tad more because it goes deeper into the skin."

"Will it leave a scar?" asks Thomas, as he nervously sits down in his chair.

"No." replies Dr. Wojtysiak, while rolling up his sleeve. "See? You can't even notice mine."

Dr. Wojtysiak reminisces of the time when he first received his chip implant during an experiment sponsored by Lifechip; a time when he was an adventurous researcher delving into the world of humancentric implants for the sake of research and scientific advancement. In those days, he would risk the unknown to progress his chip implant technology and develop new applications for its use. At a young age, Dr. Wojtysiak knew he wanted to help people and he didn't mind if he got a little recognition and financial reward for his innovations along the way.

"Ouch!" yelps Thomas, the sharp pain from a syringe enters his upper arm and in a matter of seconds, he is chipped.

*

An alarm clock rings in a small studio apartment as Zach awakes from the previous night of partying. It's 10:00am and he is running late for work. After getting ready, he rushes out to his Hyundai and waves his hand over a reader attached to his door handle. Immediately, the car comes alive and unlocks the doors and the ignition starts. Zach is in his early twenties and is on his way to *The Wreckchord*, an independently run CD store where he works. Ever since 11-9, the mass cyberterrorist theft at Microsoft, it has become difficult for people that aren't *Lifechipped* to be qualified for employment in medium to large companies. Since then, *un-Lifechipped* people like Zach are forced to work in small independently run *Mum and Pop* businesses to avoid surrendering personal information to the Lifechip database and having to get implanted. Zach had always been against Lifechip's outrageous fees and insecure database and never thought seriously about getting a Lifechip, however he could not ignore the benefits that chip implant technology could provide in his personal space. When he found out that RFID chips designed for pets could be bought at major pet stores, he bought one and got his tattoo artist to insert the chip into his body; opening the door to the convenience of having his keys always attached to his body. It wasn't that he ever had anything against the implant technology; he just didn't like the fact that a third party organization had the means to control his information, and therefore potentially control him.

Zach arrives at work around twenty-five minutes late, after having to queue up at the busy 'cash-only' toll-booth for those who do not have Lifechips and have to pay with coins. "Nice to see you could make it," Zach's boss grins.

The door to *The Wreckchord* swings open and a colorful character enters the shop; he is wearing outrageous psychedelic clothing complete with a spiked green Mohawk. "How's it going, Zach? Any new *apps* lately?" he asks. As well as being a workplace, *The Wreckchord* also plays host to the local hangout for *Hobbyist* chip implantees. Hobbyist chip implantees, like Zach, are referred to as *Indies*: "*independent implantees*". Here, the indies gather to talk about such things as, new applications they have designed for their chip implants, how evil IDA and the Lifechip is, and share their experiences of living without a Lifechip. The lifestyle of the Indies has often been compared to those of traditional non-conformist communities [50]. The *Indies*, a minority group in the Lifechipped society, are considered a lower social class.

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It is now the end of the working day and Dr Wojtysiak opens the door and exits the building. 'Beep!' an alert sounds from the door, followed by an LED indicator that lights up with '- 6:37', informing Dr Wojtysiak that he is leaving six minutes and thirty-seven seconds too early from his contracted work hours. Feeling that it is not worth a penalty in his paycheck, he steps back inside and waits the six minutes and thirty-seven seconds to fulfill his 8-hour commitment. This is not the first time that this has happened. Dr Wojtysiak has begun to realize that living with a Lifechip can be very precise and inflexible, as human actions are detailed in terms of numerical values such as time,

location, speed and elevation. Dr Wojtysiak uses the extra time at the office, to reflect on the days when he played a huge part in the development of Lifechip's software test phase. Since then the different applications of the Lifechip have expanded and cover many areas to which Dr Wojtysiak has had no input. He realizes while sitting in the room pointlessly, that it would be hypocritical to judge these new applications like those who had criticized his own research and development. The clock reads 6:00pm and Dr Wojtysiak leaves the building.

*

At the dinner table, Thomas and his Mother sit down for a microwaved meal. Thomas' Mother breaks the silence. "You know, it's for your own good. It will help you... make it easier to get a job one day."

Thomas sighs.

Two years ago, Thomas' father was in a serious car accident where his injuries required immediate surgery. Because he was unconscious and the doctors had no way of retrieving his extensive medical records to note his allergy to penicillin, he died of further complications in hospital. Since that day, Thomas' mother blames herself for his death and has been doing everything in her power to ensure that the same thing will not happen to her son. However, Thomas believes that this time, his mother has gone too far.

*

Back at *The Wreckchord*, Zach and his colorful friend are still hanging out. It is dusk and they are getting restless.

"So, do you wanna try out this cloner?" asks the guy with the Mohawk.

"Sure, let's go outside and see what we can pick up."

A *cloner* is a device that picks up Lifechip signals and decrypts the security features, providing the information needed to clone a particular chip. There have been rumors that these devices work, however Lifechip is always increasing its security features to combat anti-chip technologies. As with any technology, there are always hackers out there working to overcome security barriers. They walk outside into the street and sit down on a bench. A woman walks past as they smile and nod to her, a nice gesture to disguise their mischievous intentions. They look down at the cloner and see nothing but random letters and numbers.

"Does this thing even work?" asks Zach.

His friend ignores him and his eyes light up as another passer-by walks towards them. A middle-aged man walks past them to get to his car. The cloner's LCD screen lights up their faces, revealing four wide-open eyes of astonishment. They scurry inside to avoid any suspicion.

Once inside the store, they take a closer look at the cloner revealing endless pages of information, while the man starts his car, oblivious to the fact that people are viewing his personal records. Regardless of the excitement, Zach and his friend still recognize the legal ramifications from cloning chips and are not prepared to take that route, so they leave the cloner on a stack of CDs. The clock strikes nine and they both head home.

*

Thomas tosses and turns in his *Canberra Raiders* bed sheet. He had now been lying in bed for 2 hours, unable to sleep with his new chip implant in his arm. Thomas had always been a quiet shy type of teenager that enjoyed the privacy of his bedroom in the attic. He felt different this time; it wasn't like when he got his immunization booster shot the previous year, or his ear pierced. He knew this was a feeling that would not go away any time soon. While staring upwards from his bed, the dark room allows his mind to wander and he starts envisioning people monitoring him through the chip in his arm. "I wish I didn't have to get this implant," he thinks to himself while rubbing his arm where the chip was implanted earlier that day. He starts to scratch at the chip with a ballpoint pen. He scratches harder as his paranoia increases and his obsessions take over. His skin breaks and small drops of blood fall onto his green bed sheet. At school he had heard rumors of the *Removalists*, who for a small fee would in most instances safely remove or "decommission" the chip.

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Dr Wojtysiak enters the pub to meet with his colleagues for a drink. He scans his chip against a reader at the door. 'Welcome back, Dr Wojtysiak,' says a built in speaker. He heads to what used to be a VIP lounge of the bar and greets his colleagues. Dr Wojtysiak played a big part in the development and testing of chip implant access to exclusive lounges at nightclubs for VIP patrons in Europe. However, with the rising adoption of chip implants, hackers and cloners caught on that these particular patrons were quite wealthy. The VIPs were soon made targets for identity theft for two main reasons. First, hackers loved to work in crowded places so they could be more evasive. Second, implantees would leave their bulky chip reader blockers at home when they went out to nightclubs, so they

would not look like geeks. VIPs therefore became easy targets for *cloner* devices to discreetly scan them. Nowadays, those nightclubs that once accommodated all classes of people have turned into select VIP clubs due to the frequent occurrence of identity thefts.

"So, how was your day, Doc?" asks Dr Wojtysiak's friend, a doctor at the local Lifechip-equipped hospital.

"We had another kid with penicillin allergies get chipped today," he replies.

"Oh yeah, I saw that one in the database today. It's really sad what happened to his Dad; he had the same thing, you know."

Initially, the Lifechip database was only accessible by the most senior ICA employees to keep the customer's records confidential. However, with the increasing size of the database and need for more access and management, the tight privacy controls were ramped down as most Lifechip employees need to have access to customer's records.

Dr Wojtysiak's cell phone rings, "Thomas, did what!? Which hospital are you at? I will be right there. Just stay calm."

*

"Glad you could make it, Zach." The next morning, Zach is 30 minutes late to work again, after copping an earful from the conservative toll-booth attendant about how young adults like himself should get Lifechipped.

This time, his boss is not so amused by Zach's tardiness. "Next time, you won't be making it at all," he says.

"Sorry Boss, it's the blasted traffic in the cash-only booth. It won't happen again," replies Zach while getting the broom out, in preparation for one of his daily chores. He starts sweeping, feeling miserable that he was just scolded and that he is working this dead end job. His anger and frustration rise as he thinks more about the two wasted degrees he worked so hard to earn, and the social class distinction caused by not having a Lifechip. 'Would it be worth saving for a Lifechip? Is it worth abandoning this life of relative privacy and security for compatibility with society and the *machine*?' he thinks to himself. Then he spots the cloner from the night earlier; "ID number: 001010011010. Name: Dr Patrick Wojtysiak".

6 Conclusion

There is evidence to suggest that attitudes in society are changing and the idea of implanting a chip into a human body is becoming more acceptable. Still, there is sparse research that delves into the life of current implantees so that society can gain insights into what it is like to be microchipped. Today, there is not yet enough information for people who are considering getting an implant to decide whether the technology is positive or potentially detrimental to them and for society. The major finding of the research is that the motivation one has for implanting a chip into their body has influence on the societal implications they may experience by using the chip. This is first shown where the case studies (i.e. human subjects) are identified and distinguished by the motivation they have for getting implants (researcher, hobbyist, corporation-customer). The contrast between the experiences of each case demonstrated the varying motivations for implanting and consequently the varying impact the chip had on their lives. It is important to point out that the researcher had only kept his microchip implant during short experiments, while the hobbyist had kept his implant for a number of years (so far), and finally the VeriChip case presented a device that was theoretically implanted for life. The qualitative content analysis on the case study sources showed the main societal implications for each case. The three main themes drawn from the data collection include *technology* (researcher view), *security* (hobbyist view), and *privacy* (corporation-customer view). From researching the cases, it can be seen that the current innovators and users of chip implant technology believe that there is little or no correlation between government mandated systems like national ID and implants, although hobbyists generally do not like "enforced" or "mandatory" technology applications of any kind (this includes biometrics and even for seemingly convenience-based applications). A major implication for society that was found from studying Professor Warwick's case is that chip implant technology may cause a division in society. The insertion of chip implants may, in the future, become exclusive to only those that can afford it. Because of this, we may see a gap in social classes: the *haves* and the *have-nots*. This is best portrayed in the scenario: Zach being the *have-not* and Dr Wojtysiak being the *have*. The question of 'who decides who gets chipped?' was also explored in the scenario in the mother who insisted her thirteen year old son be implanted with a Lifechip for medical reasons and to better his future job prospects. The research does not shy away from presenting both positive and negative consequences of microchip implants to allow for the reader to reach some of their own conclusions about this confronting topic.

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